

# ZXMC4559DN8

## COMPLEMENTARY 60V ENHANCEMENT MODE MOSFET

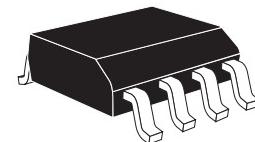
### SUMMARY

N-Channel  $V_{(BR)DSS} = 60V$ ;  $R_{DS(ON)} = 0.055\Omega$ ;  $I_D = 4.7A$

P-Channel  $V_{(BR)DSS} = -60V$ ;  $R_{DS(ON)} = 0.105\Omega$ ;  $I_D = -3.9A$

### DESCRIPTION

This new generation of TRENCH MOSFETs from Zetex utilizes a unique structure that combines the benefits of low on-resistance with fast switching speed. This makes them ideal for high efficiency, low voltage, power management applications.



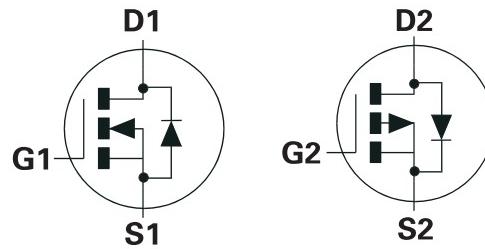
SO8

### FEATURES

- Low on-resistance
- Fast switching speed
- Low threshold
- Low gate drive
- Low profile SOIC package

### APPLICATIONS

- Motor Drive
- LCD backlighting



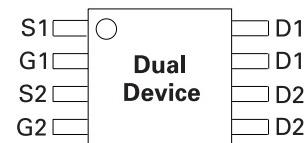
Q1 = N-CHANNEL

Q2 = P-CHANNEL

### ORDERING INFORMATION

DEVICE	REEL	TAPE WIDTH	QUANTITY PER REEL
ZXMC4559DN8TA	7"	12mm	500 units
ZXMC4559DN8TC	13"	12mm	2500 units

### PINOUT



Top view

# ZXMC4559DN8

## ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	N-Channel	P-Channel	UNIT
Drain-Source Voltage	$V_{DSS}$	60	-60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	$\pm 20$	V
Continuous Drain Current @ $V_{GS}=10V$ ; $T_A=25^\circ C$ (b) (d) @ $V_{GS}=10V$ ; $T_A=25^\circ C$ (b) (d) @ $V_{GS}=10V$ ; $T_A=25^\circ C$ (a) (d)	$I_D$	4.7 3.7 3.6	-3.9 -2.8 -2.6	A
Pulsed Drain Current (c)	$I_{DM}$	22.2	-18.3	A
Continuous Source Current (Body Diode) (b)	$I_S$	3.4	-3.2	A
Pulsed Source Current (Body Diode)(c)	$I_{SM}$	22.2	-18.3	A
Power Dissipation at $T_A=25^\circ C$ (a) (d)	$P_D$		1.25 10	W mW/ $^\circ C$
Linear Derating Factor			1.8 14	mW/ $^\circ C$
Power Dissipation at $T_A=25^\circ C$ (a) (e)	$P_D$		2.1	W
Linear Derating Factor			17	mW/ $^\circ C$
Power Dissipation at $T_A=25^\circ C$ (b) (d)	$P_D$			W
Linear Derating Factor				mW/ $^\circ C$
Operating and Storage Temperature Range	$T_j:T_{stg}$		-55 to +150	$^\circ C$

## THERMAL RESISTANCE

PARAMETER	SYMBOL	VALUE	UNIT
Junction to Ambient (a) (d)	$R_{\theta JA}$	100	$^\circ C/W$
Junction to Ambient (b) (e)	$R_{\theta JA}$	69	$^\circ C/W$
Junction to Ambient (b) (d)	$R_{\theta JA}$	58	$^\circ C/W$

Notes

(a) For a dual device surface mounted on 25mm x 25mm FR4 PCB with coverage of single sided 1oz copper in still air conditions.

(b) For a dual device surface mounted on FR4 PCB measured at  $t \leq 10$  sec.

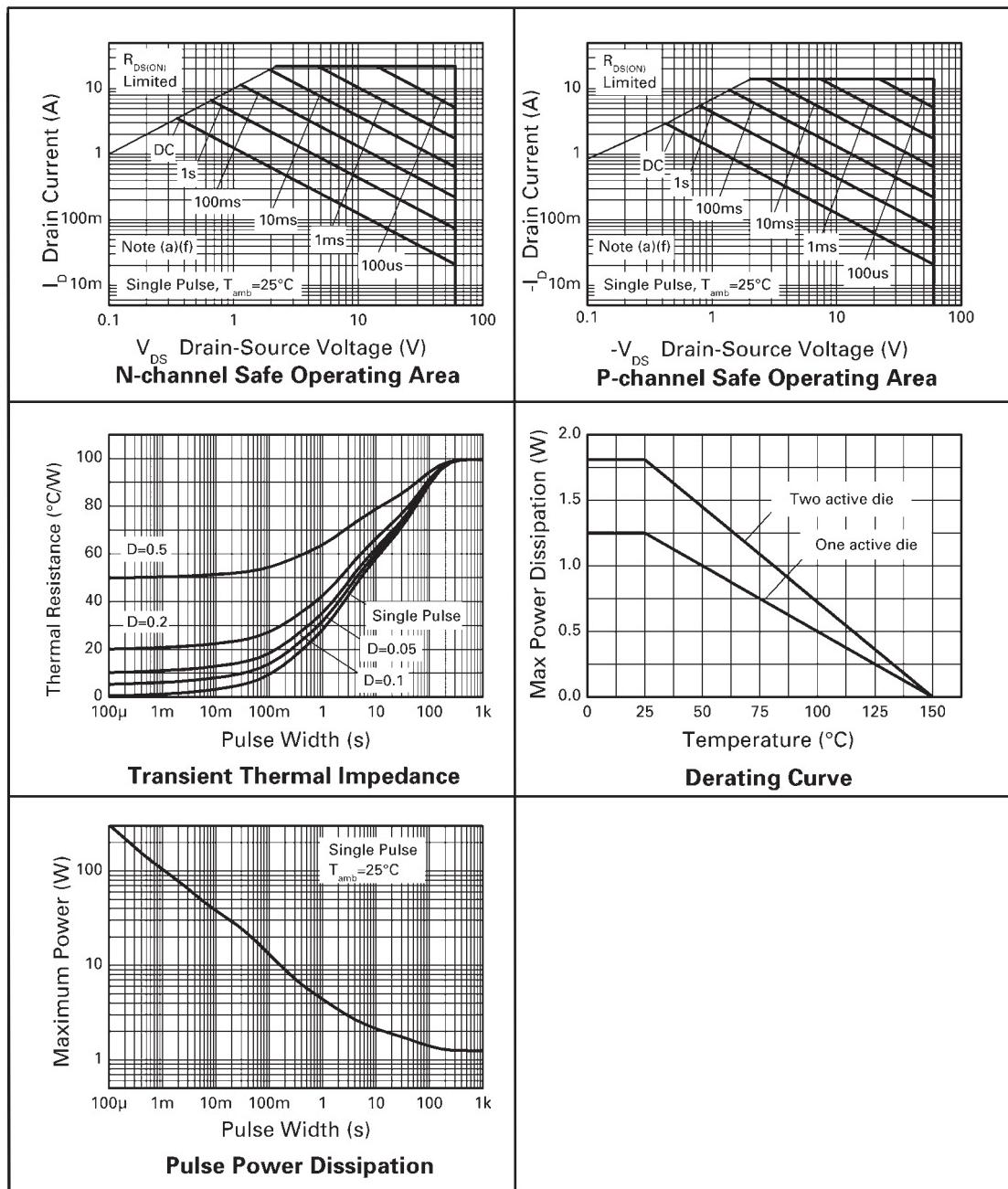
(c) Repetitive rating 25mm x 25mm FR4 PCB,  $D=0.02$  pulse width= $300\mu s$  - pulse width limited by maximum junction temperature.

(d) For a device with one active die.

(e) For device with 2 active die running at equal power.

# ZXMC4559DN8

## CHARACTERISTICS



# ZXMC4559DN8

## N-CHANNEL

ELECTRICAL CHARACTERISTICS (at  $T_{amb} = 25^\circ C$  unless otherwise stated).

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS.
<b>STATIC</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	60			V	$I_D=250\mu A, V_{GS}=0V$
Zero Gate Voltage Drain Current	$I_{DSS}$			1.0	$\mu A$	$V_{DS}=60V, V_{GS}=0V$
Gate-Body Leakage	$I_{GSS}$			100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Gate-Source Threshold Voltage	$V_{GS(th)}$	1.0			V	$I_D=250\mu A, V_{DS}=V_{GS}$
Static Drain-Source On-State Resistance <sup>(1)</sup>	$R_{DS(on)}$			0.055 0.075	$\Omega$	$V_{GS}=10V, I_D=4.5A$ $V_{GS}=4.5V, I_D=4.0A$
Forward Transconductance <sup>(1) (3)</sup>	$g_{fs}$		10.2		S	$V_{DS}=15V, I_D=4.5A$
<b>DYNAMIC <sup>(3)</sup></b>						
Input Capacitance	$C_{iss}$		1063		pF	$V_{DS}=30V, V_{GS}=0V,$ $f=1MHz$
Output Capacitance	$C_{oss}$		104		pF	
Reverse Transfer Capacitance	$C_{rss}$		64		pF	
<b>SWITCHING <sup>(2) (3)</sup></b>						
Turn-On Delay Time	$t_{d(on)}$		3.5		ns	$V_{DD}=30V, I_D=1A$ $R_G \geq 6.0\Omega, V_{GS}=10V$
Rise Time	$t_r$		4.1		ns	
Turn-Off Delay Time	$t_{d(off)}$		26.2		ns	
Fall Time	$t_f$		10.6		ns	
Gate Charge	$Q_g$		11.0		nC	$V_{DS}=30V, V_{GS}=5V,$ $I_D=4.5A$
Total Gate Charge	$Q_g$		20.4		nC	$V_{DS}=30V, V_{GS}=10V,$ $I_D=4.5A$
Gate-Source Charge	$Q_{gs}$		4.1		nC	
Gate-Drain Charge	$Q_{gd}$		5.1		nC	
<b>SOURCE-DRAIN DIODE</b>						
Diode Forward Voltage <sup>(1)</sup>	$V_{SD}$		0.85	1.2	V	$T_J=25^\circ C, I_S=5.5A,$ $V_{GS}=0V$
Reverse Recovery Time <sup>(3)</sup>	$t_{rr}$		22		ns	$T_J=25^\circ C, I_F=2.2A,$ $dI/dt= 100A/\mu s$
Reverse Recovery Charge <sup>(3)</sup>	$Q_{rr}$		21.4		nC	

## NOTES

(1) Measured under pulsed conditions. Width  $\leq 300\mu s$ . Duty cycle  $\leq 2\%$ .

(2) Switching characteristics are independent of operating junction temperature.

(3) For design aid only, not subject to production testing.

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## P-CHANNEL

ELECTRICAL CHARACTERISTICS (at  $T_{amb} = 25^\circ C$  unless otherwise stated)

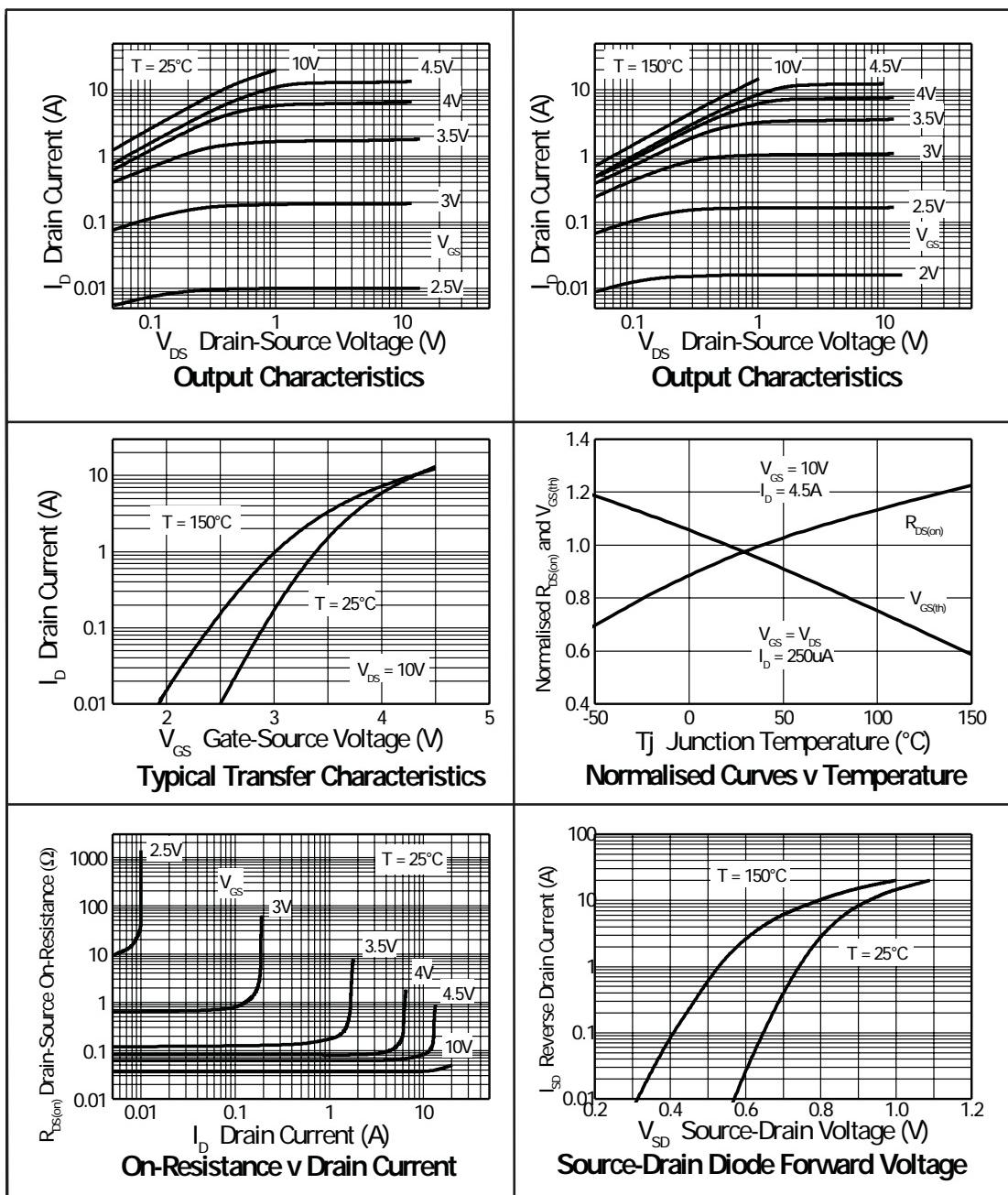
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
<b>STATIC</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	-60			V	$I_D=-250\mu A, V_{GS}=0V$
Zero Gate Voltage Drain Current	$I_{DSS}$			-1.0	$\mu A$	$V_{DS}=-60V, V_{GS}=0V$
Gate-Body Leakage	$I_{GSS}$			100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Gate-Source Threshold Voltage	$V_{GS(th)}$	-1.0			V	$I_D=-250\mu A, V_{DS}=V_{GS}$
Static Drain-Source On-State Resistance <sup>(1)</sup>	$R_{DS(on)}$			0.085 0.125	$\Omega$	$V_{GS}=-10V, I_D=-2.9A$ $V_{GS}=-4.5V, I_D=-2.4A$
Forward Transconductance <sup>(1) (3)</sup>	$g_{fs}$		7.2		S	$V_{DS}=-15V, I_D=-2.9A$
<b>DYNAMIC <sup>(3)</sup></b>						
Input Capacitance	$C_{iss}$		1021		pF	$V_{DS}=-30V, V_{GS}=0V,$
Output Capacitance	$C_{oss}$		83.1		pF	$f=1MHz$
Reverse Transfer Capacitance	$C_{rss}$		56.4		pF	
<b>SWITCHING <sup>(2) (3)</sup></b>						
Turn-On Delay Time	$t_{d(on)}$		3.5		ns	
Rise Time	$t_r$		4.1		ns	$V_{DD}=-30V, I_D=-1A$
Turn-Off Delay Time	$t_{d(off)}$		35		ns	$R_G = 6.0\Omega, V_{GS}=-10V$
Fall Time	$t_f$		10		ns	
Gate Charge	$Q_g$		12.1		nC	$V_{DS}=-30V, V_{GS}=-5V,$ $I_D=-2.9A$
Total Gate Charge	$Q_g$		24.2		nC	$V_{DS}=-30V, V_{GS}=-10V,$
Gate-Source Charge	$Q_{gs}$		2.5		nC	$I_D=-2.9A$
Gate-Drain Charge	$Q_{gd}$		3.7		nC	
<b>SOURCE-DRAIN DIODE</b>						
Diode Forward Voltage <sup>(1)</sup>	$V_{SD}$		-0.85	-0.95	V	$T_J=25^\circ C, I_S=-3.4A,$ $V_{GS}=0V$
Reverse Recovery Time <sup>(3)</sup>	$t_{rr}$		29.2		ns	$T_J=25^\circ C, I_F=-2A,$ $di/dt = 100A/\mu s$
Reverse Recovery Charge <sup>(3)</sup>	$Q_{rr}$		39.6		nC	

## NOTES

- (1) Measured under pulsed conditions. Width  $\leq 300\mu s$ . Duty cycle  $\leq 2\%$ .
- (2) Switching characteristics are independent of operating junction temperature.
- (3) For design aid only, not subject to production testing.

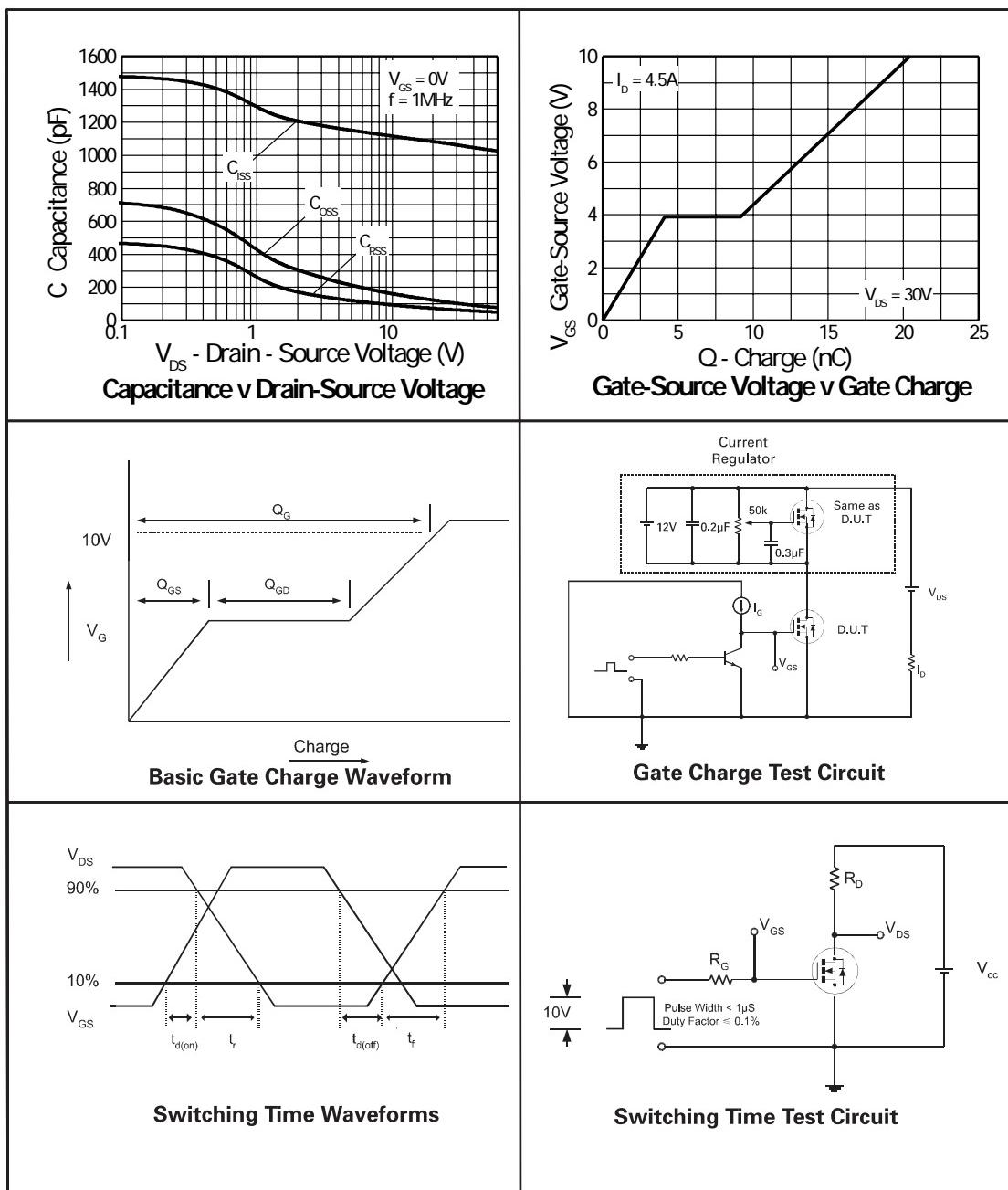
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## N-CHANNEL TYPICAL CHARACTERISTICS



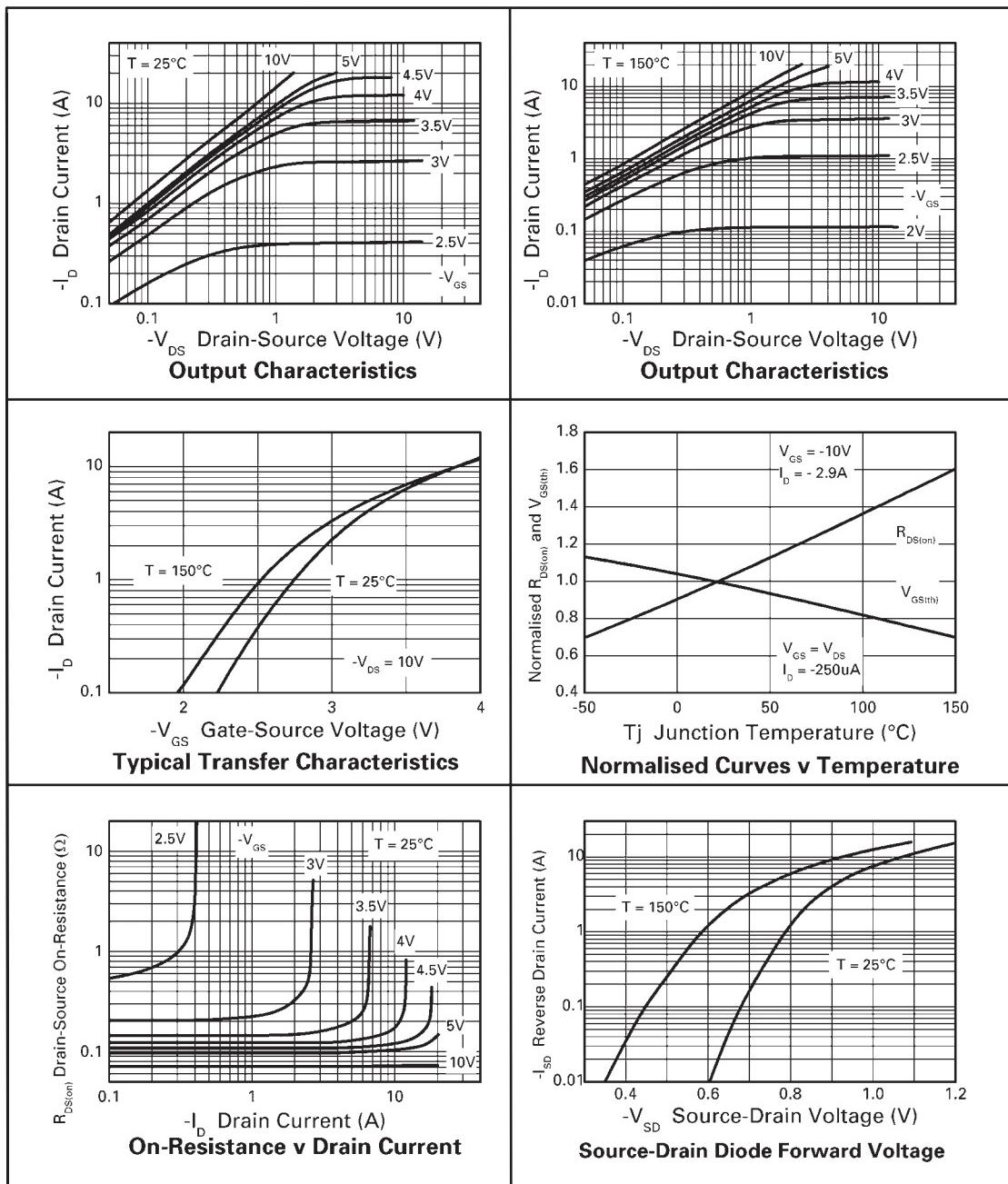
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## N-CHANNEL TYPICAL CHARACTERISTICS



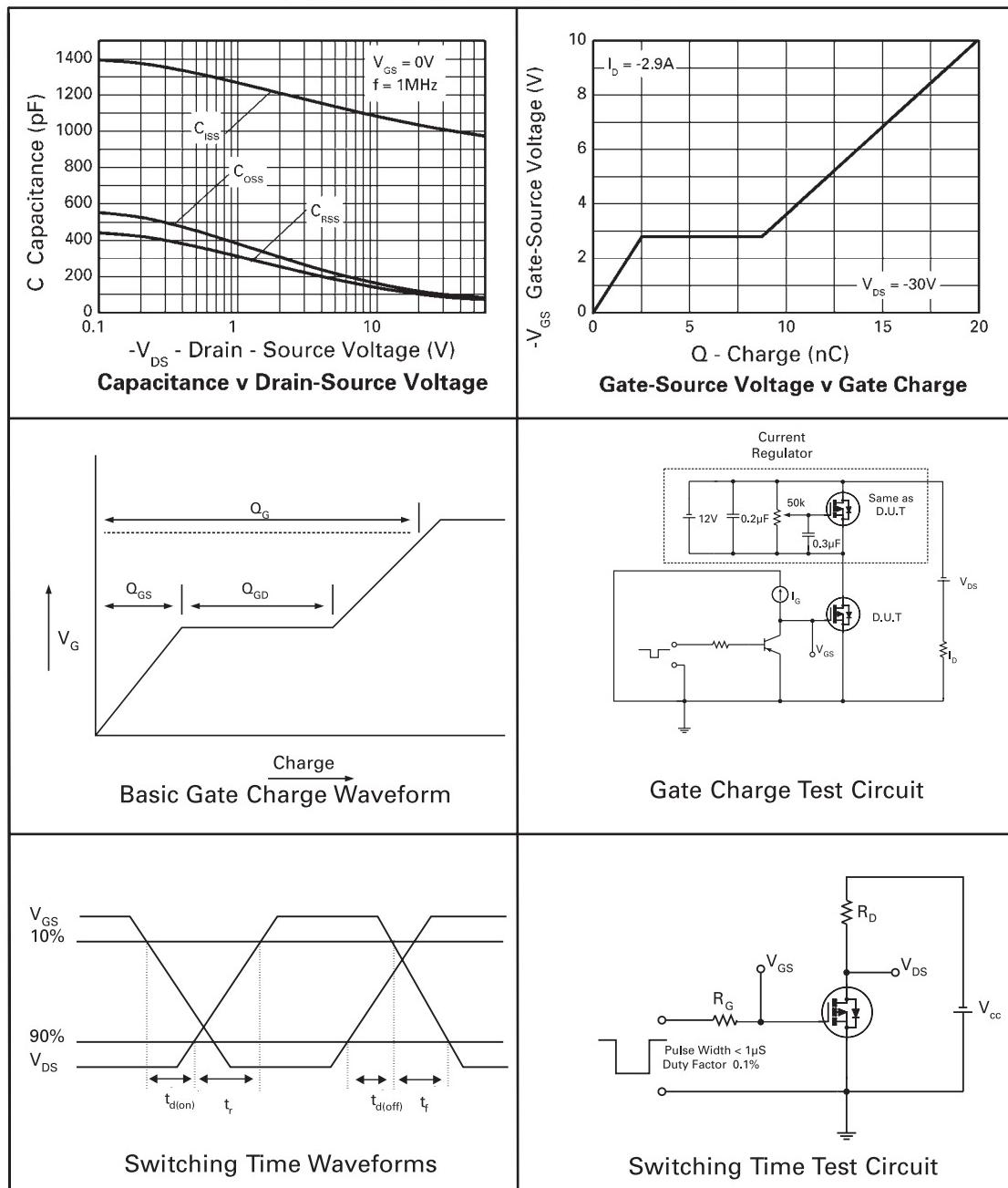
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## P-CHANNEL TYPICAL CHARACTERISTICS



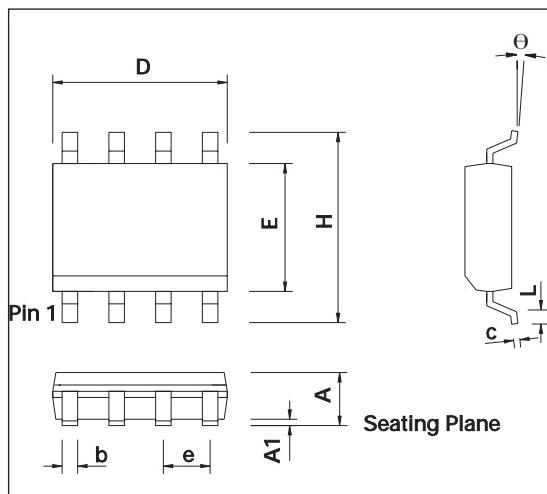
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## P-CHANNEL TYPICAL CHARACTERISTICS



# ZXMC4559DN8

## PACKAGE OUTLINE



CONTROLLING DIMENSIONS ARE IN INCHES  
APPROX IN MILLIMETRES

## PACKAGE DIMENSIONS

DIM	INCHES		MILLIMETRES	
	MIN	MAX	MIN	MAX
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
D	0.189	0.197	4.80	5.00
H	0.228	0.244	5.80	6.20
E	0.150	0.157	3.80	4.00
L	0.016	0.050	0.40	1.27
e	0.050 BSC		1.27 BSC	
b	0.013	0.020	0.33	0.51
c	0.008	0.010	0.19	0.25
θ	0°	8°	0°	8°
h	0.010	0.020	0.25	0.50

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